1. A town has an initial population of 40000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	40000	40027	40043	40055	40064	40071	40077	40083	40087

   A. Exponential

   B. Logarithmic

   C. Linear

   D. Non-Linear Power

   E. None of the above

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2. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

   Uranium is taken out of the reactor with a temperature of 110° *C and is placed into a* 17° *C bath to cool. After 37 minutes, the uranium has cooled to* 68° *C.*

   A. $k = -0.01864$

   B. $k = -0.02077$

   C. $k = -0.01921$

   D. $k = -0.01624$

   E. None of the above

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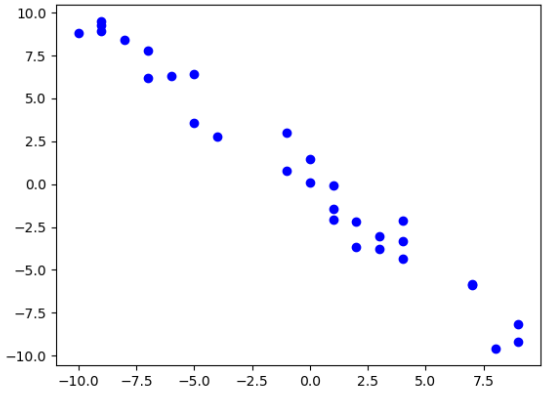
3. Determine the appropriate model for the graph of points below.



A. Linear model

B. Exponential model

C. Logarithmic model

D. Non-linear Power model

E. None of the above

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4. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 2 hours, the petri dish has 105 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 46 minutes

   B. About 140 minutes

   C. About 23 minutes

   D. About 276 minutes

   E. None of the above

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5. A town has an initial population of 50000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	50026	50056	50094	50124	50146	50176	50214	50244	50266

A. Non-Linear Power

B. Linear

C. Logarithmic

D. Exponential

E. None of the above

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6. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 630 grams of element X and after 2 years there is 126 grams remaining.

A. About 730 days

B. About 365 days

C. About 1 day

D. About 0 days

E. None of the above

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7. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's

temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 100° *C and is placed into a* 12° *C bath to cool. After 21 minutes, the uranium has cooled to* 30° *C.*

A. $k = -0.08166$

B. $k = -0.02513$

C. $k = -0.03950$

D. $k = -0.02456$

E. None of the above

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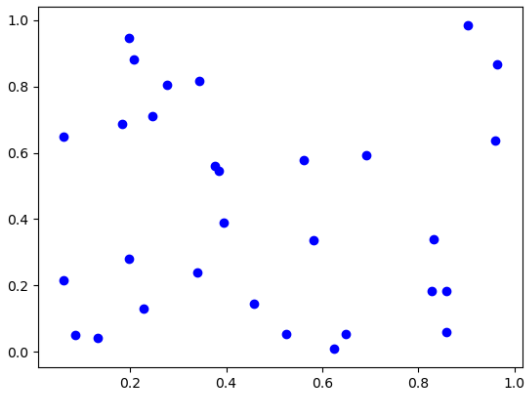
8. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Linear model

C. Exponential model

D. Non-linear Power model

E. None of the above

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9. Using the scenario below, model the situation using an exponential

function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 779 grams of element X and after 2 years there is 194 grams remaining.

A. About 1 day

B. About 730 days

C. About 0 days

D. About 365 days

E. None of the above

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10. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 2 hours, the petri dish has 149 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 115 minutes

B. About 19 minutes

C. About 199 minutes

D. About 33 minutes

E. None of the above
